



Mentoring for women economics students

Evidence from a randomised controlled trial

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Research team

This project was a collaboration between the ACT Women in Economics Network, BETA, the Office for Women and the Australian National University (ANU). The research team comprised: Catie Bradbear, Harry Greenwell, Rebecca Cassells, Scott Copley, Maria Racionero, Renee Fry-McKibbin and Tim Watson.

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The trial was pre-registered at the following locations:

- BETA website: <https://behaviouraleconomics.pmc.gov.au/projects/women-economics-student-mentoring-program>
- Open Science Framework: <https://osf.io/a57vh/> and <https://osf.io/a57vh/>
- the American Economic Association registry: <https://www.socialscienceregistry.org/trials/3396>

Who?

The Women in Economics Network

The Women in Economics Network was established in 2017 and is part of the Economics Society of Australia. It was formed to promote and support the careers of female economists in Australia. The objectives for the Women in Economics Network are to:

- Professionally connect and support the career development of women in economics
- Increase the representation of women at all levels of the economics profession
- Promote public contributions by female economists.
- Encourage young women to study economics

BETA

BETA is the Behavioural Economics Team of the Australian Government, the Australian Government's first central unit applying behavioural economics to improve public policy, programs and processes. We use behavioural economics, science and psychology to improve policy outcomes. Our mission is to advance the wellbeing of Australians through the application and rigorous evaluation of behavioural insights to public policy and administration.

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Executive summary

Economists play a central role in the analysis and decisions affecting the wellbeing of the community. In Australia, and overseas, women are under-represented in these influential roles. Increasing female representation depends on attracting and retaining women in the 'economics pipeline' yet this is not occurring in practice.

'Leakage' of women from economics is occurring during their university studies and early career. Past research suggests several factors may explain why this is the case. First, a lack of female role models. Second, women may find they relate less to highly theoretical subject matter. Third, misperceptions about career paths for economics graduates. Fourth, women may perform more strongly in other subjects relative to introductory economics. Finally, women may find a competitive class environment more offputting than their male counterparts.

In response to these findings, the ACT Women in Economics Network, in collaboration with the Department of the Prime Minister and Cabinet and the Australian National University (ANU), established a mentoring program in 2018-19 for women enrolled in economics courses at ANU. Students were matched with mid-level or senior women economists and were encouraged to meet at least four times during the course of the year. The program also included three networking events.

The program aimed to encourage students to continue with their economics studies and pursue a career in economics. It sought to do this by providing students with: a role model, a broader perspective on career options for economics graduates, and an insight into the practical applications of economics.

We evaluated the mentoring program using a randomised controlled trial, drawing on a combination of university administrative data and surveys at the commencement and conclusion of the program. We estimate students in the mentoring program were around 13 percentage points more likely to continue with economics, when compared with a control group, although this estimate is imprecise due to the small sample size (88 students). In an end-of-program survey, 70 per cent of student respondents agreed they were more likely to pursue a job in economics due to the program.

While each source of evidence, individually, has limitations, taken together the evidence suggests the mentoring program had a material impact on students' decisions to continue with economics.

Mentoring programs should, therefore, be considered in the suite of options for encouraging women students to continue economics studies and pursue an economics career. However, the potential benefits need to be weighed against the program's costs and the moderate confidence we have in our results. Context also matters: the impact may be different for a different group of mentors and students, in a different university context.

The problem

Economists play a central role in public policy and decision making. They are often the financial gatekeepers, key advisors for economic and public policy decisions on expenditure and taxation and play a critical role in both championing policies to improve wellbeing, but also preventing policies detrimental to society.

Yet in Australia, and overseas, women are underrepresented in these influential roles, particularly senior leadership roles. In Australia, around 30 per cent of senior management at the Department of the Treasury and the Reserve Bank of Australia are women. In the economics departments of Australian universities, women make up half the faculty but represent just over a quarter of senior lecturers, and only 15 per cent of associate professors and professors (Wood 2017). Women's voices are also underrepresented in Australia's major newspapers: just nine per cent of those who describe themselves as an 'analyst' or 'economist' were women (Women's Leadership Institute Australia 2016).

The representation of women in economics matters for a number of reasons. Where there is imbalance, policy issues affecting women may not be adequately recognised. This is partly because women and men have different views on these issues. Research from Europe and the US found women economists focus on different policy problems and reach different conclusions on fundamental issues like the role of government intervention versus market solutions, free trade and labour standards, the minimum wage, environmental protection, and the gender wage gap (May, McGarvey and Kucera 2018; May, McGarvey and Whaples 2013).

Decision making is also likely to be poorer due to a lack of diversity. Increasing the number of women in senior leadership positions has been shown to increase cognitive variety and knowledge stocks contributing to a wider array of solutions to problems and deeper debates, which in turn lead to more effective decision making (Adams and Ferreira 2009; Klein 2017; Matsa and Miller 2013). Women leaders also tend to work more collaboratively and democratically, which promotes sharing of key information, and enhanced decision making (Daily and Dalton 2003; Moreno-Gomez Lafuente and Vaillant 2018).

Key to increasing female representation is the attraction and retention of women in the economics pipeline. This is not occurring in practice, as indicated by the decline in the number and proportion of women studying economics over time (Dwyer 2018).¹ **There are now around twice as many male students as female students enrolled in economics at Australian universities.** This gap has widened over time—in 2001 the share of women enrolled in economics courses was 43 per cent while in 2016 it was around 34 per cent (Dwyer 2018).

Further, it is possible the number of women studying economics declines over the course of the degree. Data from the Research School of Economics at the Australian National

¹ The total number of students, both men and women, enrolled in economics has been declining as a share of the university population, however the rate of decline is faster for women than men.

University (ANU) indicates enrolment of men and women in first year microeconomics is reasonably balanced but by third year microeconomics it is substantially lower (Figure 1).

Universities are not alone in this challenge. Of the 5,000 high school students enrolled in economics in New South Wales in 2017, there were roughly twice as many males as females (Dwyer 2018).

Figure 1: Enrolment in undergraduate microeconomics courses, ANU

Year	Microeconomics 1			Microeconomics 2			Microeconomics 3		
	Male per cent	Female per cent	All n	Male per cent	Female per cent	All n	Male per cent	Female per cent	All n
2018	54	46	1,001	57	43	375	58	42	161
2017	49	51	1,559	53	47	512	69	31	170
2016	51	49	1,388	60	40	542	64	36	118
2015	53	47	1,357	64	36	210	66	34	106

Note: Female student retention or 'leakage' can be tracked *diagonally*. For example, for the 2015 cohort, 47% enrolled in micro 1, 40% enrolled in micro 2 in 2016 and 31% in micro 3 in 2017. The data for Micro 1 in 2015-2017 and Micro 2 in 2016-17 includes enrolments in semesters 1 and 2.

Source: ANU Research School of Economics

What is turning women away?

The literature has examined reasons behind the declining number of women in economics but does not reach a consensus on whether any particular issue is driving the trend. Instead a range of factors appear to be at play. These include:

- A lack of female role models—female students are unable to observe someone with similar characteristics who is accomplished in the field. (See for example, Haslehurst, Hopkins, and Thorpe 1998; Neumark and Gardecki 1998; Bayer and Rouse 2016; Jonung and Stahlberg 2008; Hale and Regev 2014; Carrell, Page, and West 2010.)
- Women do not relate to what they are studying—for example, they may be deterred by highly theoretical subject matter; hold divergent views on the material taught and in the curriculum; and not be able to see themselves in the textbooks and other material that contributes to the curriculum. (See, for example, Jensen and Owen 2001; Jensen and Owen 2000; May, McGarvey and Whaples 2013; Ferber 1995; Nelson 1995; Stevenson and Zlotnick 2018.)
- Economics career paths are not well understood—there may be a perception economics leads to a career in finance or banking, and the work is not societally meaningful. (See, for example, Turner and Bowen 1999; Smith and Zenker 2014; Bansak and Starr 2006.)
- Perceptions of their academic performance—stronger performance in other subjects relative to introductory economics may lead to the student pursuing a different major. A student's maths aptitude (or their perception of it) may also play a role. (See for example, Dynan and Rouse 1997; Bayer and Rouse 2016; Rask and Tiefenthaler 2008; Haslehurst, Hopkins, and Thorpe 1998; Dynan and Rouse 1997; Smith and Zenker 2014.)

- There may be a chilly or competitive class environment, which they find offputting (Kahn 1995; Niederle and Vesterlund 2011; Vedel and Thomsen 2017).
- There may be a culture of hostility, sexism and discrimination (Wu 2017; American Economics Association 2019).

Some of these findings were supported by a small focus group held with ANU students prior to the launch of the program (see box 1 below).

Box 1: Focus group—barriers to pursuing economics

On 12 April 2018, we held a one hour focus group with six female economics students at the Australian National University. The students were part of the Momentum program, which offered mentoring along with other job ready skills training for students in the College of Business and Economics.

All six students were later year, full-time students. Most were undergraduates and most were studying a combined degree. There were three international students and three domestic students.

The discussion explored why they were interested in economics and what they saw as potential barriers.

- **Why economics?** Most of the group became interested in economics because of its practical applications. Several were strongly influenced by inspiring high school teachers.
- **Emphasis on maths:** Most students found the level of maths challenging and most also felt it was a negative factor that detracted from 'real-world applications'. There were two dissenting voices, however, who enjoyed the challenges of the maths content.
- **Impact of marks on decision to continue with economics:** This was not deemed to be a significant issue, although one student described how the lecturer presented the assessment in an intimidating way and several agreed this sort of presentation was off-putting.
- **Career aspirations:** Participants had varied views about career directions, and noted it was only something they thought about in later years of study. During their first year they were more focused on what courses looked interesting.
- **Role models:** Two participants said female role models may have subconsciously influenced their decision to continue with economics? Female lecturers were nominated as role models: 'How can I be like you?', 'Helps me see that I could do it.'

Mentoring program design

We developed a mentoring program for women studying undergraduate economics at ANU in Canberra.

This section provides the details of the mentoring program including:

- The program's objectives
- A description of the student mentees and the mentors
- The design details, such as the matching process, guidance materials, and networking events
- The evaluation design, including surveys of students and mentors

Program objectives and overview

Given the barriers to women studying economics noted above, the ACT Women in Economics Network (WEN), with input from BETA, developed a mentoring program for women studying undergraduate economics at ANU in Canberra. Ultimately, the program aimed to encourage students to continue with their economics studies and pursue a career in economics. It would do this by providing students with:

- a role model, making a degree and/or career in economics seem more tangible and attractive
- a broader perspective on career options for economics graduates, making an economics degree more attractive
- an insight into the practical applications of economics, helping to make economics studies more interesting and relevant for the students.

We also anticipated broader benefits from the program. For example, through the mentoring program, we hoped students could expect personal satisfaction, opportunities for reflection, knowledge of more recent research or economics teaching and further development of interpersonal skills. Further, the economics faculty of the students would benefit through improved student satisfaction, (potentially) improved student outcomes, higher rates of student retention and stronger links with those practicing in the field.

Our design of the mentoring program was also informed by feedback provided by the focus group noted above (Box 2).

Box 2: Focus group—benefits and design of a mentoring program

The focus group with ANU students discussed the perceived benefits of mentoring. Students indicated mentoring could provide an insight into what it looks like to work as an economist. Mentoring could make the world of work (or various career paths) feel more tangible and achievable. And it could provide exposure to opportunities students aren't typically aware of.

We also sought suggestions for the design of the mentoring program:

- Type of mentor: Most participants agreed they would appreciate a mentor with an economics background and it would be preferable to have a female mentor: 'she would be a role model', 'I could ask her about work/family', 'I'd just prefer it'. There were mixed views about the age or experience of the mentor.
- Type of meeting: Most participants would prefer face-to-face meetings.
- Making contact: It would help if the mentor reached out to mentees, especially for the first meeting but also subsequently. 'Meeting the mentor can be daunting.'
- Conversation guides/structure: It would help to provide some structure for what to talk about with the mentor at each meeting.
- Networking: Networking with other mentors and mentees could be an added benefit of the program, in addition to engagement with one's own mentor.

The program ran for one year (covering Semester Two 2018 and Semester One 2019) and students and mentors were encouraged to meet at least four times, in person if possible. They were provided with guidance on topics to discuss and a possible meeting plan, but were otherwise left to develop the mentoring relationship as they thought best. The mentoring meetings were accompanied by three networking events.

The program had two distinctive features, both of which are described in more detail below. First, the mentors were all experienced professional women economists rather than later year students or early graduates. Second, the program was not confined to those enrolled in an economics degree. Instead, any students enrolled in a first- or second-year economics subject were eligible to apply.

Student mentees

The program was open to all women students at ANU who were enrolled in a first-year or second-year economics subject in second semester 2018. The focus on first- and second-year enrolments was informed by administrative data indicating the proportion of women students declined between first and second year, and again between second and third year (see Figure 1 above).

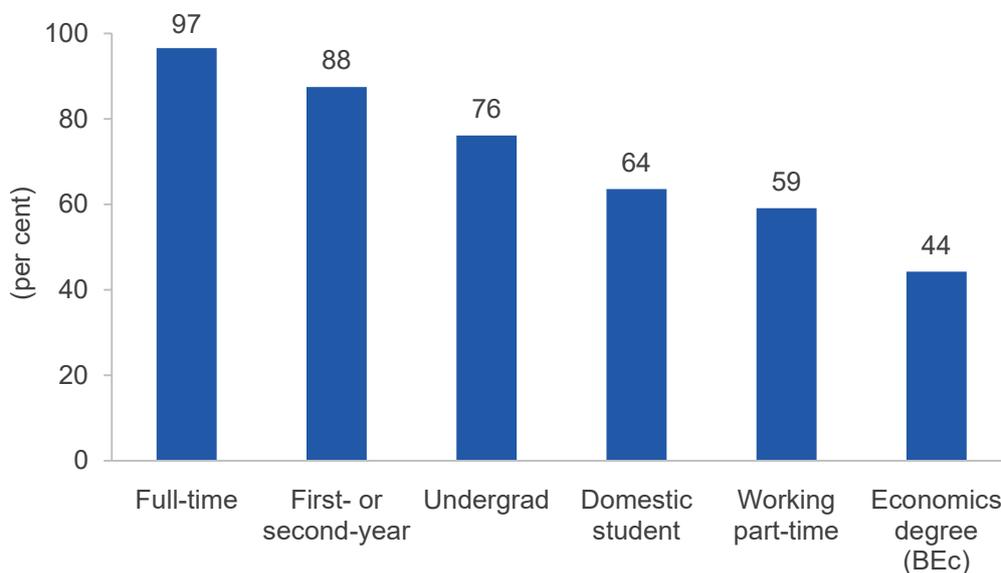
The program was open to both domestic and international students, and both undergraduate and postgraduate students. Eligibility was not confined to students enrolled in a Bachelor of Economics, as one of the program aims was to increase the retention rate of women studying economics as a major and potentially as a degree.

We conducted the application process in August 2018 and received 88 applications. There were 1,376 students enrolled in microeconomics 1 or 2 in semester one 2018 of whom 620

were women, suggesting our applications comprised about 14 per cent of the potential eligible population.

Applications included a baseline survey, which revealed almost all students were studying full-time and were in first or second year (Figure 2). (Later-year and graduate students can enrol in first- or second-year subjects and so could be eligible for the program.) Most were undergraduates, domestic students and working part-time, however less than half (44 per cent, or 39 students) were enrolled in a Bachelor of Economics. Another 14 students were pursuing masters-level economics degrees, while most of the remainder were enrolled in commerce or PPE (Politics, Philosophy and Economics).

Figure 2: Characteristics of applicants (n=88)



Mentors

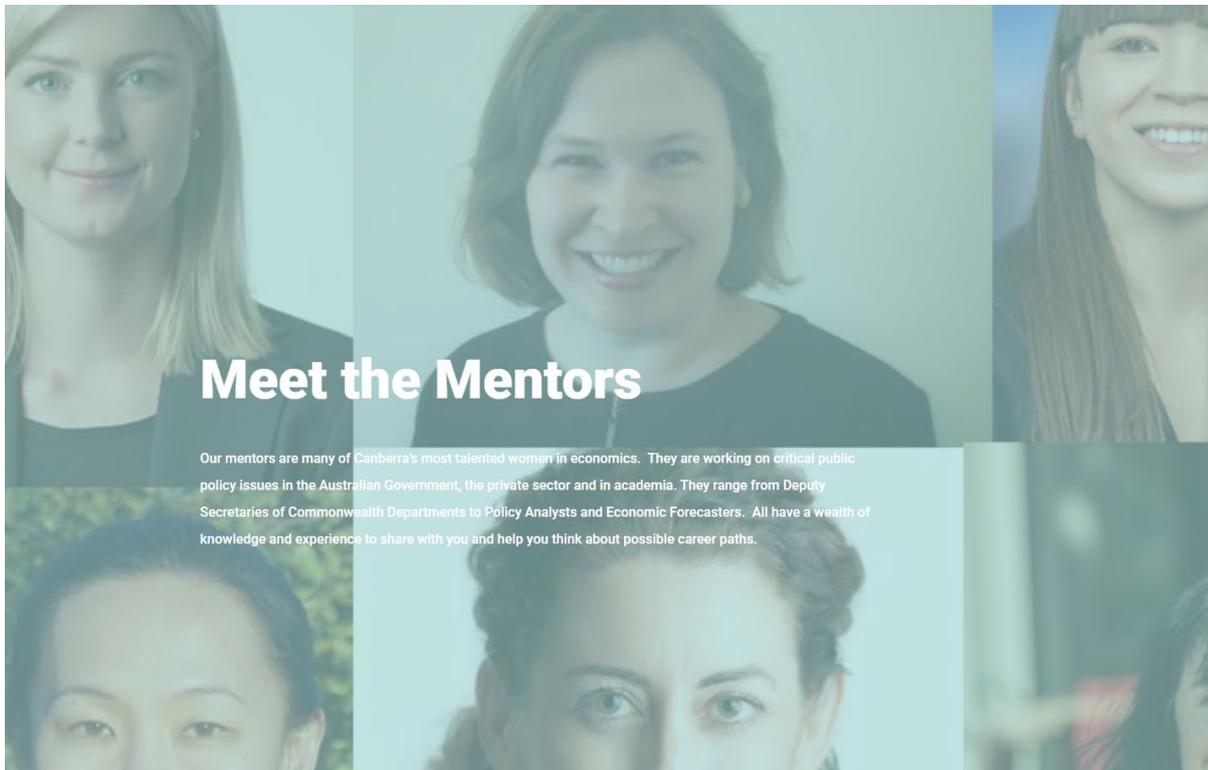
Mentors were approached through the professional networks of the program organisers. They were all experienced professional economists, from a range of backgrounds across government, academia and non-government. Mentors ranged from Deputy Secretaries of Commonwealth Departments to policy analysts and economic forecasters. Of the mentors that participated in the program, 55 per cent worked in government, 27 per cent in the private sector and 18 per cent in academic roles.

Short biographical descriptions of the mentors were made available on the program website and mentors were asked to identify their current role and organisation, the sectors they have worked in (industry, government and academia) and what type of economists they identify as (for example, research economist, labour economist). This had two purposes. First, it meant students could browse through the mentors' biographies to gain an understanding of the types of roles and careers that were available through economics. Second, students could list their preferred mentors as part of the application process.

The website was designed to be user friendly and engaging, and included information about the program, a link to the application form, contact information, and a mechanism to filter mentors by the sector they have worked in. An image of the 'meet the mentors' landing page

is provided in Figure 3, and the mentoring website can be accessed at: <http://wenmentoringact.org.au/>

Figure 3: Mentoring website landing page



Student-mentor matching process

A strong mentor and mentee match can influence the success or otherwise of a mentoring program. There is little guidance in the literature on how to best match mentors with mentees, although past research indicates matching compatible personalities is a key factor in success. Mentor-mentee similarities, such as shared fields of interest, are also important.

To assist with the matching process, students were asked to provide: three preferences for their mentor, which sector(s)—government, academia or private sector—they would like to connect with, which areas of economics they were interested in, and their extra-curricular interests. We engaged a consultancy, RapidContext, to assist with the matching process and other aspects of the program's administration, along with initial qualitative analysis.

Mentees were matched with their first preference of mentor wherever possible: almost half of mentees (47 per cent) were matched with their first preference. Just over 20 per cent of mentees were matched with their second or third preference.

For the remaining 30 per cent of students who were not matched with one of their preferred mentors, we took the following approach. First, we matched the mentee with a mentor working in the applicant's sector of interest (government, private sector or academia). Second, we matched the mentee's areas of interest with a mentor's professional experience (for example, health economics). Finally, if possible, we matched mentees to mentors with similar personal interests.

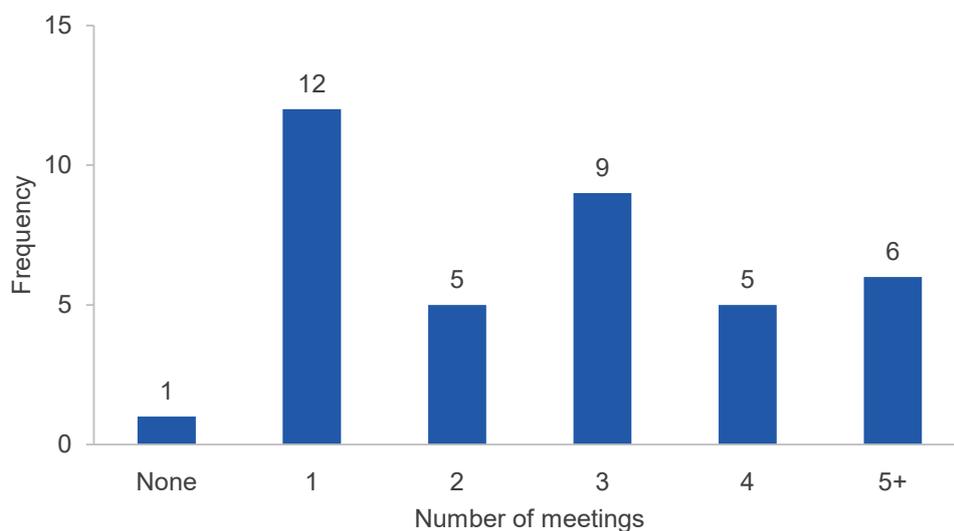
Guidance materials and mentoring meetings

To provide participants with information and advice on their participation in the program, both the mentors and mentees were provided with guidance material (available at the Open Science Framework (OSF) project page: <https://osf.io/a57vh/>). The booklet included:

- information about the program, including why it had been developed, its objectives and a timeline of events
- tips for making mentoring relationships work and expectations around the role of the mentor and mentee
- advice on how to set up the first meeting
- a suggested plan for four mentoring meetings, which set out an approach to building the relationship over those sessions (ultimately the number of mentoring sessions was up to each individual partnership, but 3-4 were what the program recommended)
- information about the evaluation
- what mentors and mentees should do if they encountered difficulties.

Although mentors and students were encouraged to have at least four meetings during the year, survey respondents reported a wide dispersion in the number of meetings (Figure 4). Almost half of the mentor respondents (18, or 47 per cent) reported having fewer than three meetings, and the student responses were similar. Mentors' free-text responses indicated this was usually despite multiple attempts to contact their mentee, suggesting some students were uninterested in the program.

Figure 4: Frequency of mentoring meetings



Endline survey (Sep 2019). N=38 (69 per cent response rate).

Networking events

In addition to the matched mentor-mentee relationship, we ran three networking events over the course of the program. The aim of these events was to bring program participants

together for further networking and provide the mentees with insights beyond what they might be receiving from their own mentor. These events were:

- a launch event, at which a panel of four eminent women economists spoke about what drew them to economics, some of the challenges they faced and why they continued to find economics a fulfilling career
- a speed networking event, in which mentees spent short periods of time – around 10 minutes, with a range of different program mentors
- a final event featuring a panel of women economists discussing the different aspects of equity, including gender equity, equity in developing countries and indigenous disadvantage.

All networking events—but particularly the first and second—were well attended by both mentors and mentees. Feedback on these events is discussed in the Results section.

Surveys of students and mentors

We conducted a baseline survey of all students in August 2018, as part of the application process. We also conducted a midline survey of students in the mentoring program in November 2018 (n=30, 55 per cent response rate) and endline surveys in August-September 2019 of: students in the mentoring program (n=30, 55 per cent), students in control (n=15, 45 per cent), and mentors (n=38, 69 per cent). The full survey questionnaires are available at the OSF project page: <https://osf.io/a57vh/>

The characteristics of survey respondents from the control group differed from the overall study population. For example, while a similar proportion of students in the control and treatment groups were enrolled in a Bachelor of Economics and were in their first year of studies (due to stratification), more control group *endline survey respondents* were enrolled in a Bachelor of Economics and were in first year in 2018 (60 per cent versus 46 per cent in both cases). This is likely to confound comparisons of survey responses between the two groups so they are not reported in the Results section (but are included in Appendix 3 for completeness).

Evaluation design

The evaluation of the mentoring program drew on the surveys described above and a randomised controlled trial (RCT) using university administrative data. This section describes the RCT design.

The research was subject to ethics approval from the ANU's Human Research Ethics Committee (protocol number 2018-513) and we registered a pre-analysis plan after the program commenced but prior to the collection of any outcome data.

The sample frame for the evaluation was women economics students at the ANU who applied to participate in the mentoring program.

We hypothesised the mentoring program would have a positive impact on confidence, knowledge and/or satisfaction with economics studies, and ultimately students who participated in the mentoring program would be more likely to continue with and complete an economics major, compared to the control group.

We assessed the impact of the mentoring program in the two subsequent semesters. For semester two 2019, our primary outcome variable was a binary measure of whether a student continued with their economics studies (defined as enrolment in one of the core macroeconomics or microeconomics units). By the first semester of 2020, some students had completed their degree so our outcome variable combined two possibilities: continuation with economics studies (as for 2019) or completion of a degree in economics.

Both these outcome variables differ somewhat from our pre-specified outcomes: see Appendix 1 for a full discussion and justification of these differences.

Prior to randomisation, we stratified the study population on three potential predictors of our outcomes (all binary variables): their year of study (first-year or later years), degree (economics degree or not), and whether they were a domestic or international student.

We received 88 complete applications and had 55 mentors. Within each strata, we randomly allocated students to 'control' or 'treatment' (the mentoring program) in a 3:5 ratio so that 55 students would be assigned to treatment. As we noted in our pre-analysis plan, this sample size meant, for plausible program effect sizes, we only had low statistical power to detect these effects.

More details on the trial design, analysis and deviations from the pre-analysis plan are set out in Appendix 1.

Results

Various sources of evidence, taken together, suggest the mentoring program had a material impact on students' decisions to continue with economics.

This section presents evidence from various sources:

- university administrative data on enrolments and Grade Point Average (GPA),
- students' self-assessments of the program's impact, and
- students' and mentors' experiences, as described in free-text survey responses.

While no single source provides definitive evidence, taken together they paint a consistent picture suggesting the mentoring program had a material impact on whether students will continue their economics studies.

Impact on economics enrolments, completions and students' GPA

Originally all students were enrolled in an economics subject in semester two 2018. By semester two 2019, students who had participated in the mentoring program appeared to be more likely to enrol in core microeconomics or macroeconomics subjects (Figure 5). Only one-third of the control group continued with a core economics subject, compared to 46 per cent of students involved in the mentoring program.

A similar pattern emerged the following year. At the end of semester one 2020, almost one-third of students in the mentoring program were still pursuing economics (that is, they were enrolled in a core economics subject or they had already completed an economics degree).² This compared with just 18 per cent in the control group.

These estimates imply students in the mentoring program were around 13-15 percentage points more likely to continue with economics. This is equivalent to an extra 7-8 students—out of the 55 in the program—opting for economics when they would not have done so otherwise. While promising, these estimates have wide confidence intervals so it is also possible the program had little or no effect.³

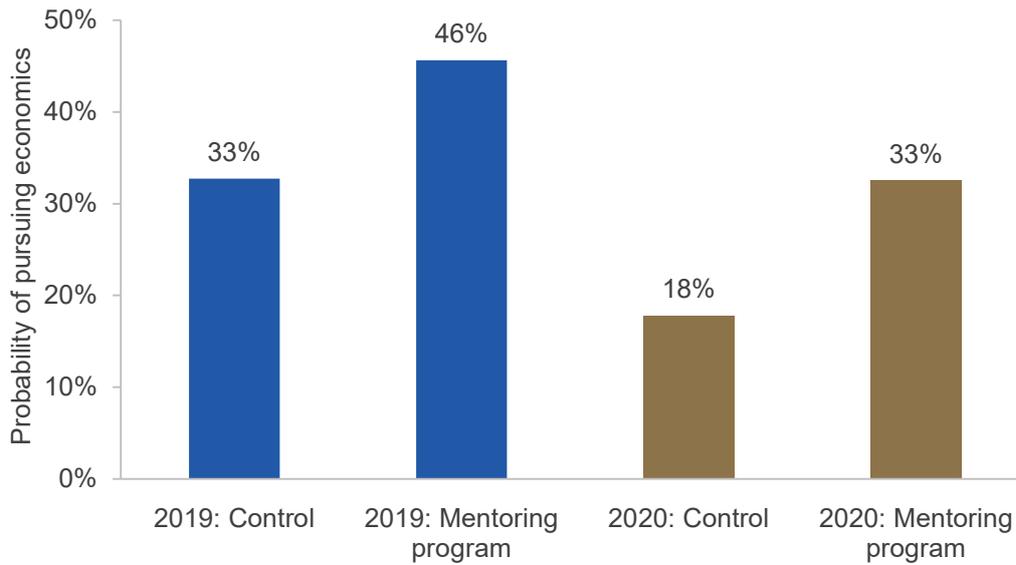
² While this outcome variable is consistent with the intent of the pre-specified outcomes, it does deviate from them and so the results for this outcome should be interpreted with some caution. See Appendix 1 for further discussion.

³ For example, in semester two 2019, the one-sided 95% confidence interval includes effects ranging upwards from a *negative* effect of four percentage points.

One mentor's free-text response gives a vivid example of the program's potential impact:

'my mentee moved to [another university] halfway through the program but changed her major to economics and told me that my mentoring was a significant factor in this decision'⁴

Figure 5: Impact on pursuing economics in 2019 and 2020



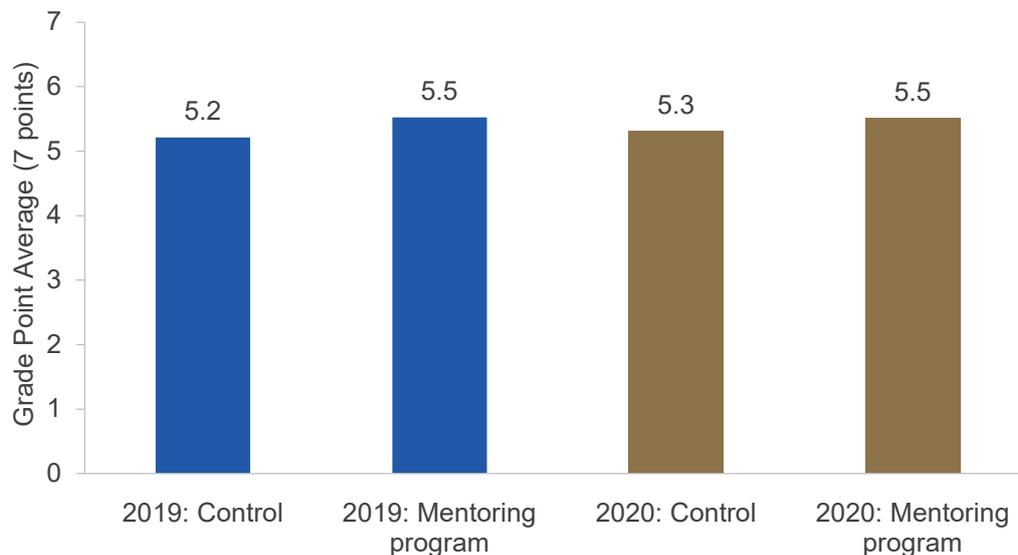
N=88 ($N_c=33$, $N_T=55$). Results from a covariate-adjusted OLS model. See Appendix 3 for full details of statistical analyses. For semester two 2019, 'pursuing economics' refers to enrolment in a core macroeconomics or microeconomics unit. The difference is 12.9 percentage points ($p=0.11$, one-sided test). For semester one 2020, 'pursuing economics' refers to economics enrolment (as above) or completion of an economics degree. The difference is 14.8 percentage points ($p=0.060$, one-sided test).

While the main purpose of the mentoring program was not to improve students' grades, it is possible mentoring increased students' motivation, or provided fruitful study tips. For example one student commented: 'Meeting the other mentors at the networking event was really motivating for my studies'. This may be reflected in students' Grade Point Average (GPA), which increased by 0.2-0.3 units for mentees in subsequent semesters (Figure 6).

These estimated GPA increases are equivalent to around 11-17 of the 55 students receiving a higher grade (for example, a Distinction instead of a Credit) as a result of the program. Again, there are wide confidence intervals on these estimates (ranging upwards from a *fall* in GPA of 0.2 units) but it is suggestive of a possibly large program impact flowing beyond enrolment decisions to study outcomes as well.⁵

⁴ Furthermore, this particular example did not figure in our results since we only had access to enrolment data from ANU.

⁵ In addition to the wide confidence interval, another reason for caution when interpreting this result is that we did not prespecify this hypothesis or outcome variable in our pre-analysis plan. Therefore, this finding should be treated as 'exploratory': a basis for further research rather than a firm finding.

Figure 6: Impact on students' Grade Point Average (GPA) in 2019 and 2020

N=88 (N_C=33, N_T=55). Maximum GPA is 7 points, equivalent to a High Distinction. Results from a covariate-adjusted OLS regression. For semester two 2019, the difference is 0.32 units ($p=0.10$, one-sided test) and for semester one 2020, the difference is 0.19 ($p=0.20$, one-sided test). This outcome variable was not pre-specified so these results should be treated as exploratory.

Students' self-assessment of program impact

We asked students, as part of the endline survey, for their assessment of whether the program had achieved its long-term objective of increasing the likelihood they would pursue a job in economics. Seventy per cent of respondents agreed with this statement (eight strongly agreed and another 13 somewhat agreed).

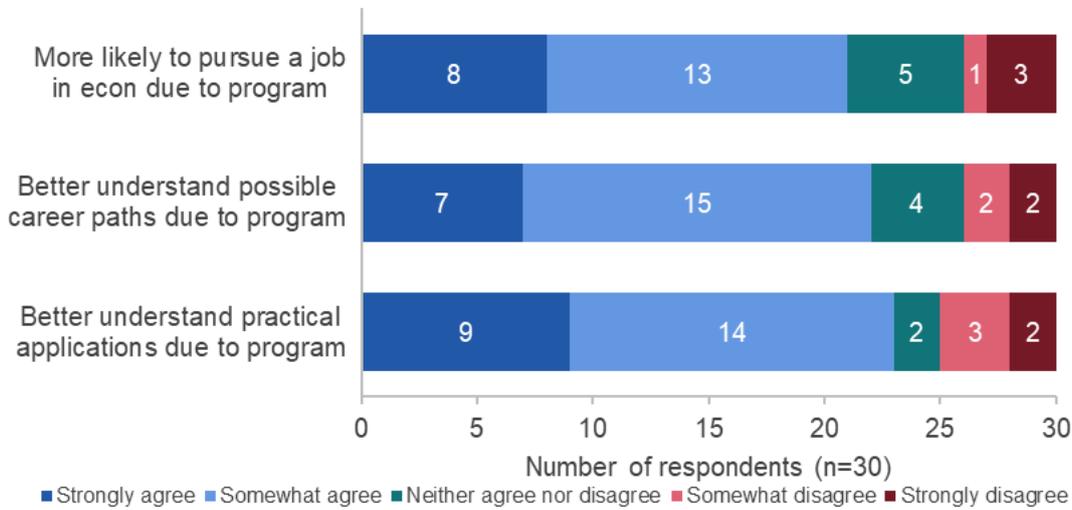
We hypothesised mentoring would increase decisions to pursue economics through several mechanisms, including a better understanding of: the practical application of economics, and the possible career paths for economics graduates. Again, most respondents agreed they had a better understanding in both domains as a result of the mentoring program (Figure 7). This was also reflected in students' free-text responses, such as:

student: 'all in all I loved the program, it opened my eyes to the actual real world of economics and career prospects'

student: '[it] was excellent to hear about her career and experience'

mentor: 'the meetings were effective at engaging on potential job opportunities and just general discussion to highlight life as an economist'

Figure 7: Self-reported impact of the mentoring program



Endline survey (Aug-Sep 2019). Questions: I have a better understanding of ... 1. the practical application of my economics studies as a result of the mentoring program. 2. the possible career paths for an economics graduate as a result of the mentoring program. 3. I am more likely to pursue a job in economics as a result of the mentoring program.

These assessments have limitations. Stated intentions may not be a reliable indicator of future decisions, and there may be a tendency for respondents to tell us what we wanted to hear. Further, the students who responded to the survey may have had more positive experiences, which would lead to an overstatement of the program’s impacts. Nonetheless, these responses suggest the program was effective for at least a substantial minority of students.

Student experiences

Student respondents predominantly reported positive experiences with the mentoring program: most (25, or 83 per cent) rated their meetings as ‘excellent’ or ‘good’, and two-thirds (20, or 67 per cent) were ‘very satisfied’ with the mentor they were matched with. Further, responses to free-text questions mostly expressed positive sentiments. While these are encouraging signs for the program, they probably also reflect a bias—noted above—in responses from students who had a favourable experience.

Students who responded to free-text questions focused on suggestions for how the program could be improved. Early on, several suggestions related to establishing contact or maintaining communication with their mentor. Specific suggestions included: discussion topics for the first meeting, initial contact from the mentor, or setting a default meeting venue. Some students asked for more detail in the guidance material.

Box 3: Students had positive experiences ...

'I had an incredible experience with my mentor and would recommend the program to anyone in a heartbeat'

'The networking events were great as I met a lot of cool people, both mentors and mentees. But I would have loved to have a FB group or at least a contact list ... so I could connect a bit better with them This would have helped me make more friends in the program. ... Anyway, all in all I loved the program, it opened my eyes to the actual real world of economics and career prospects etc and I really want to thank you for putting it all together!'

'The best event was the speed networking event; more of this sort of activity would be very helpful.'

'Was excellent to hear about her career and experience'

'My mentor was extremely upbeat, positive and cool – not something I expected from someone working in economics'

'I appreciated how friendly and kind my mentor was and that she evidently wants to help me'

'Lots of great take home messages'

'The networking event was a great way to personally meet and be exposed to multiple mentors'

'Meeting the other mentors at the networking event was really motivating for my studies'

Box 4: ... and negative experiences

'One of the mentors at the Speed Networking event was incredibly rude about my career prospects directly telling me that I had no chance of getting a job out of university as I also studied a Science degree. ... She did not offer any suggestions on how I could improve my prospects in any way, instead just ridiculed my degree choice. ... This experience ruined the whole program for me, which up until that point had been a good experience.'

'I think conducting pre-workshops for mentees, and providing related guiding materials would be helpful. Otherwise, I, as a mentee, felt somehow lost and could not really find a topic to talk about with mentor.'

'Select better mentees. I have very little interest in economics (only signed up for this for my resume) - we had nothing to talk about as I have no interest in a career in economics.'

'I still have not been contacted by my mentor and I am very disappointed'

'I didn't know what to talk about'

Response rates to free-text questions: For the midline survey, 15 students (50%) responded to questions about their first meeting and their experience of the mentoring program so far. For the final survey, 17 students (57% of respondents) gave us their suggestions for how the program could be improved.

Mentor experiences

We asked mentors for their assessment of how effective they thought the mentoring meetings had been in inspiring students to continue with economics. This gave a mixed picture: 12 mentors (32 per cent) thought the mentoring had been very or extremely effective and another eight (22 per cent) thought it moderately effective. However 17 (or 46 per cent) judged it slightly or not at all effective.⁶

Mentors' free-text responses were similarly mixed, with half expressing negative sentiments about the program. Almost all of the negative sentiments related to concerns students appeared uninterested in mentoring. Several reported the student did not respond after the initial meeting (or even before). Consequently, many mentors suggested more careful screening of candidates is required. Other mentors reported more positive experiences, both for the students and themselves.

Box 5: Mentors – some notable success stories...

'my mentee moved to [another university] halfway through the program but changed her major to economics and told me that my mentoring was a significant factor in this decision. ... My student was genuinely interested in being mentored and came prepared with some ideas for discussion.'

'My mentee was very engaged and clearly understood what she sought to gain out of the mentor/mentee engagement, which was very helpful.'

'While there wasn't always enough specific economic study issues to discuss, the meetings were effective at engaging on potential job opportunities and just general discussion to highlight life as an economist. ... I plan to continue mentoring my student ...'

'I really enjoyed the opportunity to meet young women starting their careers as economist. I would not otherwise have an avenue to meet these women and I thoroughly enjoyed the program. I hope the mentees feel the same. The program was very well run and I hope it continues.'

⁶ Total responses=37, since one respondent chose not to answer this question.

Box 6: ... but many mentors found students were uninterested

'My mentee appeared uninterested in being mentored by me, or in the program. It was quite disappointing that after our first meeting she came to no further meetings or events.'

'I felt that the mentee was not coming to our meetings with any thoughts about what they wanted help with or issues that they wanted to discuss. The mentee did not seem very engaged in the process, other than to ask me to be a referee for applications.'

'Mentee was not engaged and, even for the one meeting held, had to be chased. Economics was not her primary interest.'

'I attempted to arrange follow up meetings but never heard back from mentee.'

'My mentee was ... studying a master of accounting and had selected me as a mentor because ... she thought I would be able to help her with getting an accounting position in a big 4 accounting firm. Our meeting was pleasant and we discussed general workplace issues - such as how to apply for jobs and the benefits of internships. It was disappointing that someone not studying economics was included in the program, I was keen to provide insights from my career and felt that I was not able to do that beyond general work issues.'

Response rates to free-text questions: 33 mentors (87%) answered questions about the mentoring meetings and how the mentoring program could be improved.

Students' likelihood to continue with economics studies

We asked students at baseline and endline about the likelihood they would: continue with economics the following year, complete an economics major, complete an economics degree, or pursue a career in economics. We also asked them about their satisfaction with and confidence in their economics studies and, finally, how much they felt they knew about potential career pathways for economics graduates.

The results from these questions are presented in Appendix 3 however they face two limitations. First, changes between baseline and endline for treatment and control groups may be confounded by the low and differential response rates to the endline survey. Second, some of the baseline responses seem implausible. For example, 93 per cent of students said it was very likely they would continue economics the following year when only 33 per cent of the control group subsequently did so. In the application process, we sought to make clear applications for the program would be *randomly* assigned to the program or control. Students may, however, have overstated their interest in economics in the hope it would help them gain entry to the program

Limitations

A key limitation of this study was the *small sample size*. This meant, for a range of plausible effect sizes, even if the program had such effects, we lacked the statistical power to detect those effects using a conventional threshold for statistical significance ($p < 0.05$). In other words, while our analysis suggests the program had a substantial, positive impact on economics enrolments, we cannot assert this with a high degree of confidence.

A further limitation, noted earlier, relates to *the use of survey data*. Students and mentors who responded to the survey may have had more positive experiences with the program, introducing selection bias. Similarly, there may have been a tendency for students to tell us what they thought we wanted to hear. Finally, students' stated intentions may not be a reliable indicator of future decisions.

Another consideration is *measurement error*. We measured enrolment decisions for core economics subjects at ANU only. This does not capture enrolment in elective economics subjects, or at other universities. This measurement error applies equally to the treatment and control groups however, with a small sample size, such errors could reduce the precision of our findings.

Discussion and conclusion

It is likely mentoring had a positive impact on students' decisions to continue with economics. Mentoring programs should, therefore, be considered in the suite of options for encouraging women to pursue economics.

Despite the limitations noted above, the various sources of converging evidence give us a fair degree of confidence the mentoring program had the desired impact on students' decisions to continue their economics studies. The university administrative data suggests the mentoring program led to higher economics enrolments and degree completions, and possibly very substantially higher. In surveys, most students agreed the mentoring program made it more likely they would pursue a career in economics, while a substantial minority of mentors felt the mentoring was very or extremely effective. Furthermore, in free-text responses, students and mentors described experiences consistent with the intent of the program.

These findings suggest mentoring programs should be considered alongside other options for encouraging women students to pursue economics. However, the potential benefits need to be considered in the context of the moderate confidence we have in our results (further evaluation would help).

The potential benefits should also be weighed against the program's costs and sustainability relative to other possible options. Recruiting mentors, matching mentors and mentees, preparing guidance material and running networking events involved considerable volunteer time and some administration costs. Some of these costs may diminish with time, especially if mentors are willing to remain for several iterations of the program, but non-negligible costs will remain. This includes the resources required to administer the program, and the impost on mentors' time, although most mentors (76 per cent) estimated this was less than six hours over the course of the program.

A related consideration is how well our results will generalise to other circumstances. Our mentors were all mid-level or senior professionals. The calibre of our mentors may have contributed to the number of applicants and the apparent success of the program. A different group of mentors—with a different group of students in a different university context—may not have the same impact as we observed in our study. This will depend, in part, on whether the same barriers apply to women students in other universities, and whether another set of mentors can be recruited who would be in a position to address those barriers.

Lessons for future mentoring programs

The most important lessons relate to what worked well and should be preserved. Two stand out. First, we made an investment in the initial *program administration* by recruiting a consultant to assist us. Feedback on the program administration—and the initial guidance materials—was very positive. Second, students really enjoyed the *networking events* and especially the ‘speed mentoring’ event, for the opportunities to meet other mentors and other students. Future mentoring programs should build on this by incorporating networking events, and possibly other networking tools, as a core component of the program.

A key challenge in the program design is the *mentee eligibility criteria*. We deliberately kept the criteria broad to capture the ‘marginal’ economics student (that is, the student who is uncertain about whether she will continue with economics). However, this meant we also included some students who were uninterested in economics and/or mentoring, leading to wasted time and unfulfilling experiences for their mentors. Requiring students to complete a more demanding application process may address this issue however it may also deter participants. Alternatively, future programs may be better targeted if restricted to current Bachelor of Economics students, while still addressing the overall objective of the program.

A mentoring program’s effectiveness depends on the quality of *the relationship between mentors and mentees*. Despite the positive feedback on the guidance provided and the effort taken to match mentees with their preferred mentor, many students said they would have appreciated more help establishing contact with their mentor, and several struggled to clarify purpose or discussion topics for their meetings. Given the success of the speed mentoring event, including this type of event at the outset may help the mentor and mentee relationship to develop more rapidly.

Finally, there may be scope to vary *the timing and duration* of future mentoring programs. The program commenced midway through the second semester 2018, which may have been beneficial in encouraging students to enrol in economic studies for the following year. On the other hand, the effects of the mentoring may have dissipated over the long summer break, immediately before enrolled in courses for semester one 2019. The year-long duration of the program could also be revised: a more condensed timeframe may be similarly effective.

Appendices

Appendix 1 - Evaluation design and analysis

Overview

We conducted a randomised controlled trial (RCT) as a partnership between the Women in Economics Network, the Department of Prime Minister and Cabinet, and the Australian National University (ANU). We randomly assigned students to participate in the mentoring program, or not, where the unit of randomisation was the individual economics student.

The trial commenced in August 2018 and ran for 12 months over semester two 2018 and semester one 2019. We assessed the impact of the mentoring program on students' subsequent enrolment decisions and grades in semester two 2019 and semester one 2020. Participants in the RCT was not 'blinded' as it was not possible to prevent them from knowing whether they had been allocated to the mentoring program or not.

We also collected survey data at baseline (August 2018), midline (November 2018) and endline (August-September 2019).

Pre-registration, pre-analysis plan (PAP) and deviations from the PAP

We pre-registered the trial, along with our pre-analysis plan, in two registries:

- the American Economic Association RCT Registry (9/10/2018): [AEARCTR-0003396](https://www.aeaweb.org/rct/record/0003396)
- the Open Science Framework (12/10/2018): <https://osf.io/pt89y> (registration) and <https://osf.io/a57vh/> (main project page, including the pre-analysis plan and all survey questionnaires)

We subsequently registered the trial on the BETA website.

We made one deviation from the pre-analysis plan in relation to our outcome variables. We pre-specified four primary outcomes but have only used two, with some amendments. See the 'Outcome variables' section immediately below for further details of these amendments and their justification.

Outcome variables

We pre-specified four closely related **primary outcomes**, all of which sought to detect the propensity for students to complete economic studies. Two outcomes were based on endline survey data about study intentions, while the remaining two were based on university administrative data about enrolment decisions.

- a) Intention to proceed to next year of economics studies (survey data, 5-point Likert scale)
- b) Intention to complete an economics major (survey data, 5-point Likert scale)

- c) Whether a student continued with economics in the next year of studies, 2020 (administrative data, binary variable based on enrolments in compulsory second- or third-year economics courses)
- d) Whether a student completes an economics major (administrative data, binary variable)

We dropped outcomes (a) and (b), the two survey-based measures of intentions to continue with economics studies, because the endline survey response rates (55 per cent for treatment, 45 per cent for control) were too low.

We modified outcome (c)—the proportion of students who proceed to the next year of economics studies—in two ways. First, we expanded its scope modestly to include enrolment in compulsory *first-year* economics subjects, so the binary variable was marked ‘yes’ for enrolment in any ‘core’ unit required for an economics major: microeconomics 1, 2 or 3 or macroeconomics 1, 2 or 3.⁷ Second, we applied outcome (c) to the *next semester* (that is, semester two 2019) rather than the *next year* (as prespecified) because, by 2020, 17 later-year students had already completed their degree and so could not enrol in any of the core economics units. We regard both changes as minor and consistent with the intent of our pre-specified outcome.

We were unable to use outcome (d) as prespecified due to unanticipated difficulties in getting data on completion of an economics major. Instead, to assess the impact of the program in 2020, we combined economics degree completion and—for those who had not yet completed their degree—enrolment in a core economics unit.⁸ This hybrid outcome is strongly connected to the intent of the mentoring program to encourage students to complete an economics major or degree and thus, we believe, is also consistent with the intent of our prespecified outcomes. However, it involves a more substantial deviation from our pre-analysis plan so the results for this outcome should be interpreted with some caution.

Due to the impact of COVID-19, in S1 2020 students were given the option of replacing their grade for any unit with ‘Course Requirement Satisfied/Not Satisfied’. There were 18 students who took this option for at least one unit and so these units are not reflected in their GPA.

We also prespecified **secondary outcomes** for several mediator variables that, we hypothesised, should lead to changes in the primary outcomes. However, these were all survey-based measures and, due to low and differential survey response rates, we did not conduct statistical tests on the differences in these variables. Where descriptive statistics seemed informative, they are reported in the Results section or in Appendix 3 below.

Finally, we conducted **exploratory analysis** on students’ Grade Point Average (GPA), which took values from zero to seven. (That is, High Distinction=7, Distinction=6, Credit=5, Pass or Pass at supplementary exam=4 and zero is assigned for Fail, Not completed/fail, or Withdrawn with failure.) Although we did not pre-specify this outcome or an associated hypothesis, we did conduct statistical tests of whether grades were higher for the treatment group than for control.

⁷ Course codes ECON1101, ECON2101, ECON3101, ECON1102, ECON2102 and ECON3102.

⁸ An economics degree was defined as a Bachelor of Economics, a Master of Economics, a Master of Economic Policy, or a Master of Applied Economics. We excluded degrees in accounting, commerce, finance, business administration, or PPE (politics, philosophy and economics).

Population and sampling

The population of interest for evaluating a mentoring program like ours is the subset of women economics university students who may wish to participate in a mentoring program. This definition is vague because the students who wish to participate may change depending on how it is advertised. For example, more students may decide they are interested in the program if it is advertised more aggressively. This is relevant for generalising the results of this study as the mentoring program may have different impacts for different students. For example, mentoring may be less effective for a student who only decides to participate after aggressive advertising as compared to a student who is eager to participate.

For this study, all women students at the ANU who were enrolled, in first semester 2018, in a first- or second-year economics subject were eligible to apply for the mentoring program. The program was advertised through a number of channels. The ANU sent an email distributed to first- and second-year economics students, and advertised the program through the weekly ANU College of Business and Economics newsletter. The program was mentioned by lecturers in some of their first- and second-year subjects. Finally, the program was advertised through the Women in Economics Network, the Economics Society of Australia and the Australian Government Economics Network.

The study sample comprised the 88 students who submitted a complete application by the closing date. To provide some indication of the eligible population, there were 1,376 students enrolled in microeconomics 1 or 2 in the relevant semester. Of these, 620 were women, suggesting our applications comprised about 14 per cent of the potential population.

We did not strictly enforce the eligibility criteria: we simply asked applicants to confirm they met them. These criteria were relatively broad, as they included at least 48 students (55 per cent of the sample) who were not enrolled in a Bachelor of Economics. Of these, 14 were pursuing masters degrees in economics, economic policy or applied economics, 10 were commerce students and another 8 were enrolled in Politics, Philosophy and Economics. The remainder were studying a range of degrees including arts, finance, accounting, business administration and international relations.

Power calculations and sample size

The sample size was determined by the number of applicants for the mentoring program, and the size of the treatment group was determined by the number of mentors available.

In our pre-analysis plan, we noted this study had low statistical power to detect plausible effects of the mentoring program, if indeed it did have an effect. The original power analysis was based on a range of scenarios that varied the sample size, treatment/control ratios, the test (one- or two-sided), and plausible effect sizes. We used the conventional alpha of $p < 0.05$ in the absence of a good rationale for a different choice.

We repeated the power analysis based on our final sample size ($N_T=55$, $N_C=33$), the one-sided test that we pre-specified, and the effect sizes we used for the initial scenarios (increases of 8-10 percentage points from an estimated base rate of continuing with economics of 34 per cent). This suggested we had very low power—around 19-24 per cent—to detect these effect sizes, if the program had such effects.

Randomisation and balance checks

Prior to randomisation, we stratified the sample on three binary variables:

- Year of study (first year or second year),
- Domestic/international student status, and
- Degree of study (Bachelor of Economics or not).

This should have given us eight strata cells however there was only one student in one of the cells (first year, international student enrolled in a Bachelor of Economics) so she was placed in the same cell as other first year, international students. We then randomised within each stratum using simple randomisation. That is, we used a random number generator to assign—within each stratum—approximately a fixed proportion (33/55, or 60 per cent) of students to control or treatment (the mentoring program). In practice, the allocation within individual cells did not perfectly match this ratio (Figure 8).

Figure 8: Stratification variables

Strata ID	Year of study	Residency status	Degree	Control	Treatment	All	C:T ratio
1	Later year	International	Non-B.Ec	4	6	10	67%
2	Later year	International	B.Ec	2	4	6	50%
3	Later year	Domestic	Non-B.Ec	4	7	11	57%
4	Later year	Domestic	B.Ec	8	14	22	57%
5	First year	International	Both	6	10	16	60%
6	First year	Domestic	Non-B.Ec	4	8	12	50%
7	First year	Domestic	B.Ec	5	6	11	83%
All				33	55	88	60%

We report baseline characteristics for the treatment and control groups in Appendix 3. We did not conduct formal statistical tests for balance on these characteristics however the descriptive statistics suggest the groups were very similar on most available measures including, for example, mean age (20.8 versus 20.5 years) or whether they studied economics in year 11 or 12 (55 per cent versus 56 per cent). As expected, there were some differences, for example, in part-time work (55 per cent versus 62 per cent), or in attending a public high school in year 12 (42 per cent versus 53 per cent).

Data cleaning

The university's administrative data on enrolments and GPA was the key data set for our analysis. This data came in the requested format so no data cleaning was required and no outliers were removed.

The survey data required some cleaning. For the baseline survey, we dropped incomplete applications, which were treated as ineligible and thus dropped prior to randomisation. We also found three duplicates records where the same student had commenced the application twice: these records were merged. For the endline surveys, there were several incomplete responses (six from control, one from treatment) that we dropped as none contained substantive responses.

Method of analysis

We used ordinary least squares (OLS) regression to estimate average treatment effects (ATE) following an intent-to-treat analysis. These estimates, confidence intervals and p-values were derived from a model with the following specification:

$$y = \alpha + \tau_1 Z + \tau_2 X + \tau_3 ZX + \epsilon$$

Where y represents our outcome variables, Z is a treatment indicator (and so τ_1 represents the ATE), and X is a matrix of demeaned strata variables and the single covariate (baseline likelihood to continue with economics studies in the following year).

We conducted one-sided hypothesis tests. These were not mentioned in our pre-analysis plan but they were prespecified on our OSF pre-registration page (<https://osf.io/pt89y>, see the sub-section 'Analysis Plan/inference criteria'). For consistency, we also report one-sided confidence intervals. We calculated HC2 robust standard errors.

We also conducted robustness checks. First, we analysed the binary outcome on enrolments using logistic regression. Second, we conducted unadjusted analysis. That is, we removed the covariate however we continued to include strata dummy variables since they were part of our research design. (Removing the strata dummies had no material impact on our results. See Appendix 3 for details.)

Trial threats

Spillovers: We continue to hold the view, noted in our pre-analysis plan, that the risk of spillover from mentees to non-mentees was likely to be small because we hypothesised that actual exposure to the mentor is what would change intentions and behaviour.

Attrition/missing data—administrative data: By design, we had no missing data for our primary outcome (enrolments) since we only coded a value of one if students were enrolled in the specified units at ANU. This could introduce some measurement error if, for example, a student continued with economics studies at another university. (Free-text survey responses indicate this occurred for at least one student in the treatment group.) We had two missing observations for our exploratory analysis of GPA (both in treatment), which were dropped from the analysis. They appear to be first year students who discontinued their studies before completing any subjects.

Attrition/missing data—survey data: As noted above, we had low and differential response rates to our endline survey (55 per cent for treatment, 45 per cent for control). This introduces the risk that treatment respondents were systematically different from the control respondents, confounding any comparisons and undoing the benefits of randomisation. We identified some systematic differences on observed baseline characteristics, which are reported in Appendix 3 along with baseline-endline comparisons. However, decided we could not conduct credible statistical tests on those outcomes.

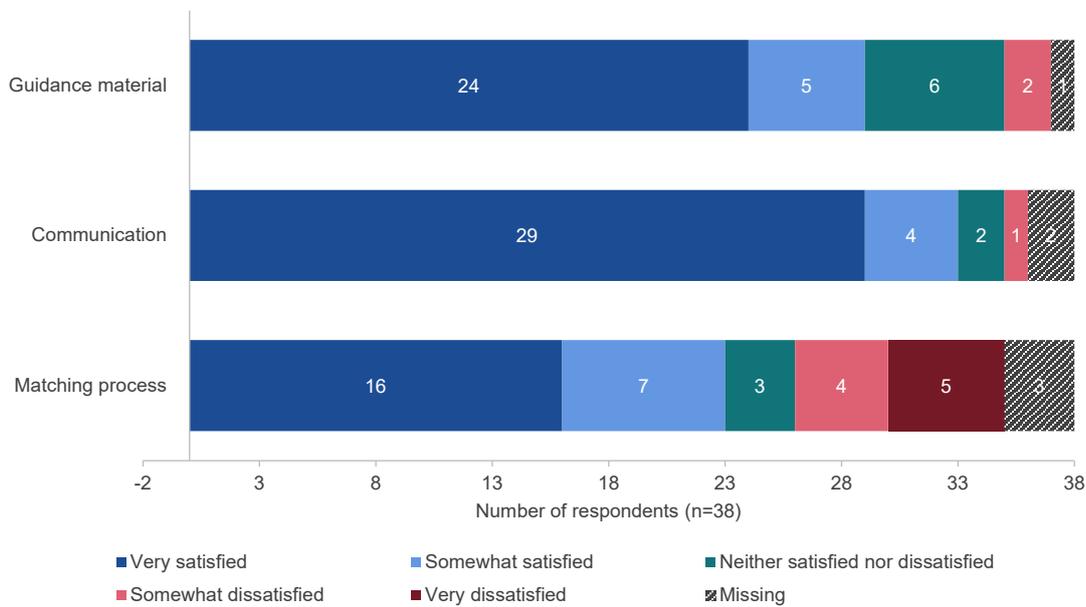
Appendix 2 - Administration and events

This appendix summarises survey responses relating to the program’s administration and networking events.

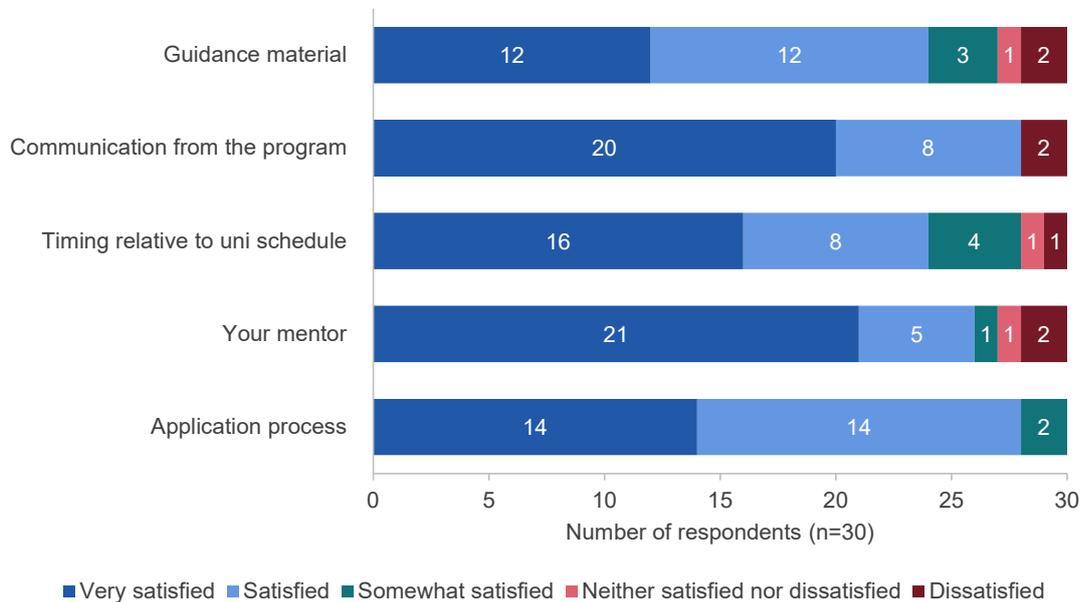
Program administration

Student and mentor respondents were satisfied with the mentoring program’s administration (Figures 9 and 10). A large majority (over 80 per cent) were satisfied or very satisfied with all aspects of the program that we asked about, with one exception. Around one quarter of *mentor* respondents were dissatisfied with the matching process. As discussed in the Discussion and Conclusion, this may reflect issues with the initial screening of candidates to be eligible for the program, rather than the subsequent matching process.

Figure 9: Mentor satisfaction with program administration



Endline survey (Sep 2019). Questions: Please indicate your satisfaction with: 1. Communication from the administrators. 2. The matching process. 3. The guidance material provided.

Figure 10: Student satisfaction with program administration

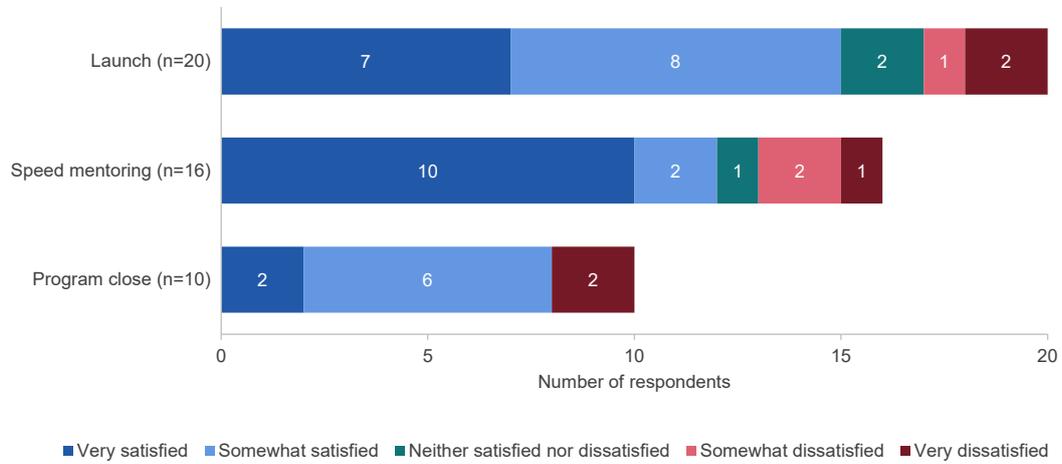
Midline survey (Nov 2018). The final category 'dissatisfied' combines three response options (somewhat dissatisfied, dissatisfied, and very dissatisfied). Questions: Please indicate how satisfied you are with the following aspects of the mentoring program so far.... 1. The application process. 2. The mentor you were matched with. 3 The timing of the program with regards to your uni schedule. 4. Communication from the mentoring program. 5. The guidance material about the program.

Events

Students particularly liked the speed mentoring event: 10 of the 16 respondents who attended were 'very satisfied' with that event (Figure 11). The launch event achieved the highest attendance amongst respondents, with the lowest for the program close. The main reasons students could not attend were clashes with work (16 out of 30) or with studies (10 out of 30).

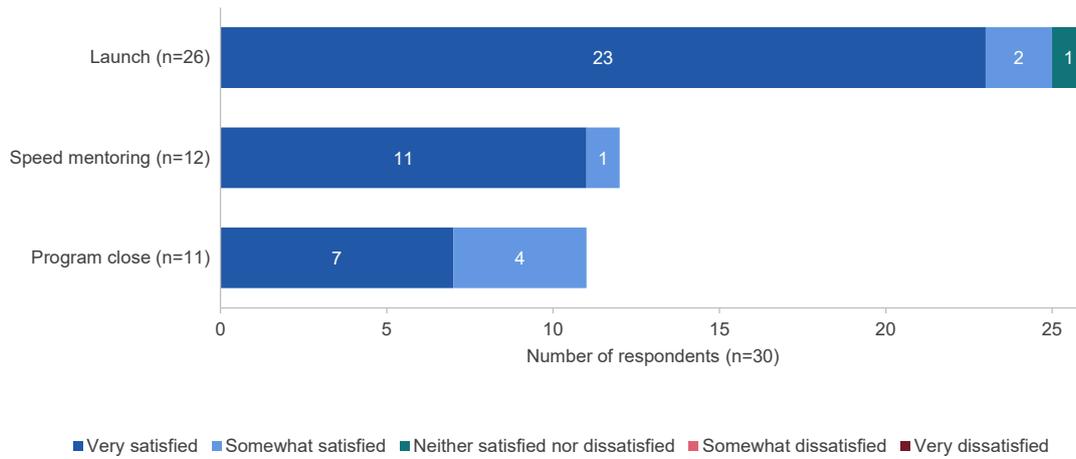
Most mentor respondents were very satisfied with all three events, although there was somewhat lower satisfaction with the program close (Figure 12).

Figure 11: Student satisfaction with networking events



Endline survey (Aug-Sep 2019). Question: How satisfied were you with each of these events?

Figure 12: Mentor satisfaction with networking events



Endline survey (Sep 2019). Question: How would you rate these events?

Appendix 3 - Statistical tables

This appendix presents the full results and statistical analysis from our study. It is structured as follows:

- Impact of mentoring on: economics enrolment, and Grade Point Average (GPA)
- Baseline characteristics and balance checks
- Comparison of baseline and endline survey responses

Impact of mentoring on economics enrolment or completion

The tables below present the statistical analysis for the primary outcomes:

- *semester two 2019* (the semester following the conclusion of the mentoring program): enrolment in a core macroeconomics or microeconomics unit
- *semester one 2020*: enrolment in a core economics unit or completion of an economics degree.⁹

Our results suggest mentored students were substantially more likely to enrol in and complete economics than those in the control group however the wide confidence intervals imply that it is also possible the program had little or no effect (Figure 13 and 17). Our robustness checks vary little from our primary analysis (Figures 14 and 15).

We also estimated the impact of mentoring in 2020 on enrolments only. While we pre-specified this outcome in our analysis plan, it is clearly an inferior measure since 17 later-year students had already completed their degree by 2020 and so could not enrol in any of the core economics units (Figure 16). Consequently, although this analysis produced a null result, we do not regard this as informative of the program's impact (Figure 18).

As expected, in 2019 our 'enrolments' outcome was largely driven by enrolments in second- and third-year macroeconomics (Figure 19). However it also captured a small number of students enrolled in *first-year* macroeconomics or second-year *microeconomics*. Similar, by semester one 2020, enrolments were predominantly in third-year macroeconomics, with a couple of students in second-year microeconomic.

Figure 13: Economics enrolment S2 2019, primary analysis

Treatment	N	Enrolled in economics (%)	Difference (ppts)	95% CI (one-sided)	p-value	Standard error (ppts)
Control	33	32.7%				
Mentoring	55	45.6%	12.9%	(-4.2%, inf)	0.106	10.3%

Note: Covariate-adjusted OLS regression, where covariate=baseline likelihood to continue studying economics next year, one-sided test with HC2 robust standard errors. Thus, the value for control (32.7%) represents the average re-enrolment rate over all values of the covariate and strata dummies (the 'average marginal mean').

⁹ While we have referred to this as a 'primary outcome', it deviates from the prespecified outcomes and so should be interpreted with more caution. See discussion in Appendix 1 for details.

Figure 14: Economics enrolment S2 2019, robustness check – unadjusted

Treatment	N	Enrolled in economics (%)	Difference (ppts)	95% CI (one-sided)	p-value	Standard error (ppts)
Control	33	32.1%				
Mentoring	55	45.3%	13.3%	(-3.1%, inf)	0.091	9.8%

Note: OLS regression without covariate adjustment (but with strata dummies), one-sided test with HC2 robust standard errors. Exclusion of strata dummies reduces the difference (average marginal effect) to 12.1% and increases the p-value to 0.131.

Figure 15: Economics enrolment S2 2019 robustness check – logit

Treatment	N	Enrolled in economics (%)	Difference (ppts)	p-value	Standard error (ppts)
Control	33	33.3%			
Mentoring	55	45.5%	12.1%	0.126	10.6%

Note: Unadjusted logistic regression, one-sided test. The value for control (33.3%) represents the average re-enrolment rate for a student in the control group. The equivalent OLS regression gave the same estimates of the 'Difference' and a very similar p-value (0.131). We attempted logistic regression for the primary analysis with covariate adjustment and interaction with treatment however this model does not converge. We also conducted further logistic regressions where we included the strata dummies and/or the covariate but without interacting with treatment. These produced very similar average marginal effects and p-values to the equivalent OLS regression.

Figure 16: Economics enrolment or degree completion S1 2020

	Control	Mentoring	All
Completed an economics degree	1	9	10
Completed a non-economics degree	3	4	7
Enrolled in a 'core economics' unit	5	9	14
Other	24	33	57
All	33	55	88

Figure 17: Economics enrolment or degree completion S1 2020

Treatment	N	Pursued economics (%)	Difference (ppts)	95% CI (one-sided)	p-value	Standard error (ppts)
Control	33	17.8%				
Mentoring	55	32.5%	14.8%	(-0.83%, inf)	0.060	9.4%

Note: The outcome 'pursued economics' includes students who had completed an economics degree by the end of Semester One 2020 or who were enrolled in a core economics unit. Covariate-adjusted OLS regression, where covariate=baseline likelihood to continue studying economics next year, one-sided test with HC2 robust standard errors.

Figure 18: Economics enrolment only S1 2020

Treatment	N	Enrolled in economics (%)	Difference (ppts)	95% CI (one-sided)	p-value	Standard error (ppts)
Control	33	14.9%				
Mentoring	55	16.3%	1.4%	(-12.0%, inf)	0.432	8.0%

Note: Covariate-adjusted OLS regression, where covariate=baseline likelihood to continue studying economics next year, one-sided test with HC2 robust standard errors.

Figure 19: Economics enrolment by subject, 2019 and 2020

		Micro 1	Micro 2	Micro 3	Macro 1	Macro 2	Macro 3
S1 2019	Enrolled	0	23	16	3	7	0
	Not enrolled	88	65	72	85	81	88
S2 2019	Enrolled	0	3	0	2	15	17
	Not enrolled	88	85	88	86	73	71
S1 2020	Enrolled	0	0	12	0	2	0
	Not enrolled	88	88	76	88	86	88

Impact of mentoring on Grade Point Average (GPA)

We did not pre-specify Grade Point Average (GPA) as one of our outcome variables so the results below should be treated as exploratory. Nonetheless, we tested an after-the-fact hypothesis that the mentoring program led to a higher GPA. We believe this is broadly consistent with our theory of change for the program, since the mentoring may have increased students' motivation, or helped them acquire skills or resources that supported their studies.

As with our analysis of enrolment outcomes, our results suggest mentored students achieved a substantially higher GPA than those in the control group however the wide confidence intervals imply that it is also possible the program had little or no effect. Our robustness checks vary little from our primary analysis.

The GPA ranges from zero to seven as follows: High Distinction=7, Distinction=6, Credit=5, Pass or Pass at supplementary exam=4, and zero is assigned for Fail, Not completed/fail, or Withdrawn with failure.

Figure 20: GPA S2 2019, primary analysis

Treatment	N	GPA (0-7 score)	Difference	95% CI (one-sided)	p-value	Standard error
Control	33	5.20				
Mentoring	55	5.52	0.32	(-0.10, inf)	0.102	0.249

Note: Covariate-adjusted OLS regression, where covariate=baseline likelihood to continue studying economics next year, one-sided test with HC2 robust standard errors.

Figure 21: GPA S2 2019, robustness check – unadjusted analysis

Treatment	N	GPA (0-7 score)	Difference	95% CI (one-sided)	p-value	Standard error
Control	33	5.21				
Mentoring	55	5.51	0.29	(-0.11, inf)	0.117	0.245

Note: OLS regression without covariate adjustment (but with strata dummies) one-sided test with HC2 robust standard errors. Exclusion of strata dummies gives only marginally different results.

Figure 22: GPA S1 2020, primary analysis

Treatment	N	GPA (0-7 score)	Difference	95% CI (one-sided)	p-value	Standard error
Control	33	5.31				
Mentoring	55	5.51	0.19	(-0.19, inf)	0.201	0.230

Note: Covariate-adjusted OLS regression, where covariate=baseline likelihood to continue studying economics next year, one-sided test with HC2 robust standard errors. Due to the impact of COVID-19, in S1 2020 students were given the option of replacing their grade for any unit with 'Course Requirement Satisfied/Not Satisfied'. There were 18 students who took this option for at least one unit and so these units are not reflected in their GPA.

Baseline characteristics and balance checks

This section details the general characteristics of our sample frame at baseline, along with students' views of their economics studies. In addition, the tables below present descriptive statistics for assessing balance between the treatment and control groups: they were very similar on most available measures.

Figure 23: Baseline characteristics (continuous variables)

	Control mean (SD)	Treatment mean (SD)	All mean (SD)
Age	20.8 (3.2)	20.5 (2.4)	20.6 (2.7)
Confidence with economics studies (0-10 scale)	6.4 (1.6)	6.9 (1.5)	6.7 (1.6)
Satisfaction with economics studies (0-10 scale)	7.5 (1.3)	7.7 (1.3)	7.6 (1.3)
Time spent on economics studies, outside of class time (hours/week)	12.7 (15.5)	11.0 (9.2)	11.6 (12.0)

Figure 24: Baseline characteristics (strata variables)

	Control n	Treatment n	All n	Control %	Treatment %	All %
	33	55	88	100.0	100.0	100.0
Domestic or international student?						
Domestic	21	35	56	63.6	63.6	63.6
International	12	20	32	36.4	36.4	36.4
Enrolled in a Bachelor of Economics?						
No	18	30	48	54.5	54.5	54.5
Yes	15	24	39	45.5	43.6	44.3
NA	0	1	1	0.0	1.8	1.1
Year of study						
First year	15	24	39	45.5	43.6	44.3
Later year	18	31	49	54.5	56.4	55.7

Figure 25: Baseline characteristics (categorical variables)

	Control	Treatment	All	Control	Treatment	All
	n	n	n	%	%	%
	33	55	88	100.0	100.0	100.0
Year of study						
First year	15	24	39	45.5	43.6	44.3
Second year	10	28	38	30.3	50.9	43.2
Third year	4	3	7	12.1	5.5	8.0
Fourth year	3	0	3	9.1	0.0	3.4
Fifth year or later	1	0	1	3.0	0.0	1.1
Studied economics in year 11 and/or year 12						
Yes	18	31	49	54.5	56.4	55.7
No	15	24	39	45.5	43.6	44.3
Currently studying full-time or part-time?						
Full-time	31	54	85	93.9	98.2	96.6
Part-time	2	1	3	6.1	1.8	3.4
Mother or father's highest qualification (whichever is highest)						
Postgraduate degree	11	25	36	33.3	45.5	40.9
Bachelor's degree	18	25	43	54.5	45.5	48.9
Completed Year 12	3	4	7	9.1	7.3	8.0
Completed high school (but not to Year 12)	1	1	2	3.0	1.8	2.3
Type of school when you completed year 12						
Catholic	3	5	8	9.1	9.1	9.1
Independent	16	21	37	48.5	38.2	42.0
Public	14	29	43	42.4	52.7	48.9
Level of paid work						
Not working	13	19	32	39.4	34.5	36.4
Part-time work	18	34	52	54.5	61.8	59.1
Full-time work	2	2	4	6.1	3.6	4.5
Undergraduate?						
Undergraduate	27	40	67	81.8	72.7	76.1
Postgraduate	6	13	19	18.2	23.6	21.6
Missing	0	2	2	0.0	3.6	2.3

Figure 26: Likelihood of continuing with economics at baseline

	Control	Treatment	All	Control	Treatment	All
	n	n	n	%	%	%
	33	55	88	100.0	100.0	100.0
How likely to continue economics next year						
Very likely	30	52	82	90.9	94.5	93.2
Somewhat likely	1	3	4	3.0	5.5	4.5
Neither likely nor unlikely	2	0	2	6.1	0.0	2.3
Somewhat unlikely	0	0	0	0.0	0.0	0.0
Very unlikely	0	0	0	0.0	0.0	0.0
How likely to complete an economics major						
Very likely	27	38	65	81.8	69.1	73.9
Somewhat likely	4	7	11	12.1	12.7	12.5
Neither likely nor unlikely	1	4	5	3.0	7.3	5.7
Somewhat unlikely	1	2	3	3.0	3.6	3.4
Very unlikely	0	4	4	0.0	7.3	4.5
How likely to complete an economics degree						
Very likely	21	39	60	63.6	70.9	68.2
Somewhat likely	4	3	7	12.1	5.5	8.0
Neither likely nor unlikely	2	6	8	6.1	10.9	9.1
Somewhat unlikely	4	4	8	12.1	7.3	9.1
Very unlikely	2	3	5	6.1	5.5	5.7
How likely to pursue a career in economics						
Very likely	19	29	48	57.6	52.7	54.5
Somewhat likely	11	19	30	33.3	34.5	34.1
Neither likely nor unlikely	3	7	10	9.1	12.7	11.4
Somewhat unlikely	0	0	0	0.0	0.0	0.0
Very unlikely	0	0	0	0.0	0.0	0.0

Comparisons of baseline and endline survey responses

The students who responded to the endline survey were somewhat different from the overall sample frame. Endline respondents were more likely to be: domestic students (71 versus 64 per cent), enrolled in a Bachelor of Economics (49 versus 44 per cent), and a first-year student at baseline (49 versus 44 per cent).

There were also differences between the endline respondents from the control and treatment groups. More of the control group respondents were enrolled in a Bachelor of Economics and more were in second year by the time of the endline survey. Such differences could confound comparisons between treatment and control.

Figure 27: Respondents' characteristics at baseline and endline

	Baseline survey (%)			Endline survey (%)		
	Control	Treatment	All	Control	Treatment	All
n	33	55	88	15	30	45
General characteristics						
Domestic student	63.6	63.6	63.6	73.3	70.0	71.1
Full-time student	93.9	98.2	96.6	93.3	93.3	93.3
Enrolled in a B.Ec	45.5	43.6	44.3	60.0	43.3	48.9
Undergraduate	81.8	72.7	76.1	73.3	76.7	75.6
Year of study						
First year	45.5	43.6	44.3	0.0	3.3	2.2
Second year	30.3	50.9	43.2	60.0	43.3	48.9
Third year	12.1	5.5	8.0	26.7	43.3	37.8
Fourth year	9.1	0.0	3.4	13.3	10.0	11.1
Fifth year or later	3.0	0.0	1.1	0.0	0.0	0.0

Likelihood of continuing with economics: Respondents' assessment of their likelihood of continuing with economics in both the treatment and control groups, however in most cases they fell by more for the control group (the exception is the likelihood of continuing with economics next year, Figure 24). We are not confident these changes are attributable to the mentoring program, however, due to the high and differential non-response rates for the endline survey.

Figure 28: Average likelihood of continuing economics (n=45)

	Baseline mean	Endline mean	Difference
Continue studying economics next year			
Control	4.8	4.4	-0.4
Treatment	5.0	4.5	-0.5
Complete an economics major			
Control	4.7	4.1	-0.6
Treatment	4.4	3.9	-0.5
Complete an economics degree			
Control	4.6	4.0	-0.6
Treatment	4.3	4.1	-0.2
Pursue a career in economics			
Control	4.5	3.6	-0.9
Treatment	4.3	4.1	-0.2

Note: Means are calculated from a 5-point scale, with Very unlikely=1 and Very likely=5. Each question began: 'Please indicate how likely you are to: ...'

Confidence, satisfaction and career knowledge: Satisfaction with, and confidence in, economics studies fell for respondents in both the treatment and control groups, however they fell by more for the control group (Figure 25). While respondents' knowledge of career

pathways stayed the same for the control group, it increased for those in the mentoring program. As noted above, we are not confident these changes are attributable to the mentoring program due to the high and differential non-response rates for the endline survey.

Figure 29: Career knowledge, satisfaction and confidence (n=45)

	Baseline mean	Endline mean	Difference
Career knowledge (1-5 scale)			
Control	3.1	3.1	0.0
Treatment	2.7	3.1	+0.4
Satisfaction (0-10 scale)			
Control	7.5	6.1	-1.4
Treatment	7.5	7.1	-0.4
Confidence (0-10 scale)			
Control	6.7	6.2	-0.5
Treatment	6.6	6.5	-0.1

Question for career knowledge: 'Please indicate how much you feel you know about the potential career pathways for economics graduates'. Answers ranged from 1='None at all' to 5='A great deal'. Questions for satisfaction and confidence: 'Please indicate how satisfied/confident you are with your economics studies'. Answers ranged from 0=completely dissatisfied/not at all confident to 10=completely satisfied/extremely confident.

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